

A REVISION OF *TRIANOPTILES* Fenzl.

By MARGARET R. LEVYNS.

In 1829 Steudel established the genus *Ecklonea* for a single species which was known to the majority of subsequent workers as *E. capensis*. Unfortunately the name *Ecklonia* had been used in 1828 by Hornemann for a common South African seaweed, and according to modern rules of nomenclature this name cannot be applied to the Cyperaceous plant. Fenzl's name *Trianoptiles* [Endl. Gen. Pl., p. 113 (1836)] must therefore be adopted.

Trianoptiles is closely related to *Carpha*, and the chief difference hitherto given lies in the perianth, which in *Trianoptiles* usually consists of three hairy scales each with three bristles at the apex, whereas the perianth of *Carpha* consists of six simple bristles. In view of the fact that in the plant described as *E. solitaria* by C. B. Clarke [Fl. Cap. VII, p. 759 (1900)] the perianth segments may occasionally be very narrow and have one bristle only at the apex, the two genera appear to approach one another very closely. Until recently the writer was inclined to follow Pfeiffer [Fedde Rep. XXIX, p. 180 (1931)] and merge the genera. However, it has now been discovered that *Trianoptiles* possesses in addition to its bisexual spikelets, female 1-flowered spikelets at the base of the plant, and it is the subterranean fruits of these female spikelets which in the past have been termed bulbils or tubers. These spikelets are described fully below. In considering generic distinctions the presence of these peculiar, partially subterranean spikelets in all three species of *Trianoptiles* is significant, as they are absent from *Carpha*. Thus it is clear that the genus should be maintained and its definition extended.

The following account of the spikelets and fruits is based on observations made on *T. capensis* Harv. A normal, bisexual spikelet after anthesis is shown in Fig. 2 C (a). The diagram (Fig. 1 A.), will make the arrangement of the parts clear. The spikelet is cymose in character, and possesses four bracts below the flowers. A flower then terminates the main axis, and growth is continued by an axillary branch which bears one bract (only visible on dissection) and a terminal flower. Each flower has three perianth scales of the type shown in Fig. 2 C (b), three stamens, and a trigonous ovary beaked at the apex (Fig. 2 C (c),) and terminated by a style which eventually divides into three branches. The structure

of the spikelet has been illustrated by C. B. Clarke, though at that time the cymose nature of the spikelets in certain members of Cyperaceae had not been recognised, and in Clarke's illustration (Illustr. Cyp. t. 77, 5) the arrangement of the dissected spikelet suggests a racemose inflorescence with a terminal, sterile bract. The female spikelet has up to the present escaped notice. The plant is tufted in habit, and the female spikelets

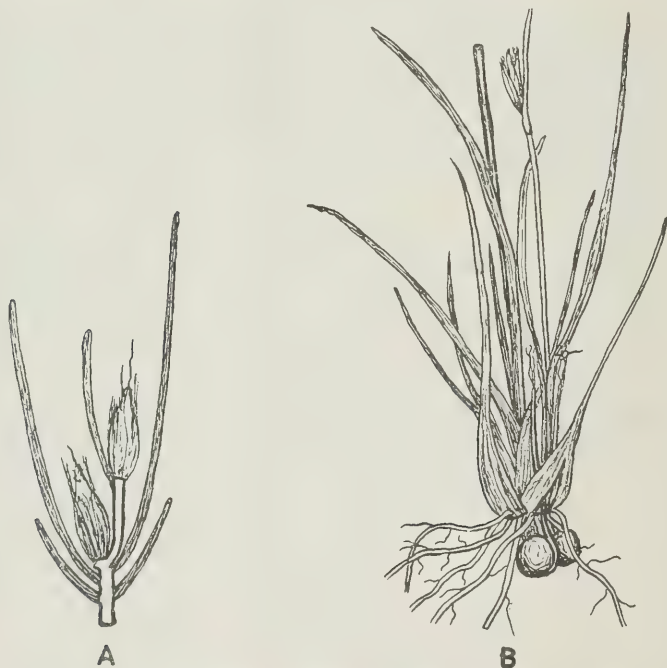


FIG. 1. A. Diagram of a bisexual spikelet of *Trianoptyles capensis* (in the fruiting stage).
B. Portion of a plant of *T. capensis* showing two female spikelets in fruit
✓ 2.

arise at the bases of the stems, usually below ground level. A young spikelet is shown in Fig. 2 F. Most spikelets have three bracts, though occasionally four may be present. The bases of all the bracts are thin and delicate and wrap closely round the ovary, so that the number of bracts involved is difficult to see. As a rule only two are prolonged above the ovary, and of these the lower is usually colourless (occasionally green at the tip) and wraps closely round the narrow, closed tube formed by

the uppermost bract. The length of the latter is variable, depending apparently on the depth at which the spikelet is formed below the level of the soil. The narrow, sheathing nature of this bract is shown in Fig. 2 F, where the projecting style and its three branches may also be seen. Apparently this styler sheath increases in length after pollination, as in old spikelets the tube is relatively longer, and only the tips of the style branches project. A striking feature of development in later stages is the marked intercalary growth of the lateral axis immediately below the spikelet. This is shown in Fig. 2 G, where the ripening fruit is seen carried out more or less horizontally away from the main stem. This growth ruptures the leaf sheath enveloping the spikelet, which is carried some distance from its point of origin. As a consequence of these developments the base of the style and its sheathing bracts get bent back and curve round the ovary. The majority of old fruits will be found with the curved remains of these structures still evident. Fig. 1 B shows two old spikelets in position after intercalary growth has ceased. Careful examination will always reveal the withered style branches and the slender sheathing bract of each spikelet among the leaf sheaths at the base of the plant.

T. solitaria has similar female spikelets, but here little or no intercalary growth takes place, so that the ripening fruit usually remains encased by the leaf sheaths at the base of the plant, giving a superficial resemblance to *Isoetes*. A third species which is described in this paper has female spikelets much as in *T. capensis*, but with less marked intercalary growth.

As the definition of *Trianoptiles* must be modified, and as fresh information is available with regard to the species, a short revision of the genus has been made.

TRIANOPTILES Fenzl.

Annual plants, tufted in habit. Spikelets of two kinds, those of the aerial inflorescences bisexual, those partially hidden among the basal leaves female. *Bisexual spikelets*, greenish in colour, cymose, with 3—5 more or less distichous bracts and in most cases two perfect flowers, associated with the two uppermost bracts. Perianth scales three, hairy at the base and usually terminated by three stiff bristles, occasionally the two lateral bristles wanting. Stamens three. Style with three long branches. Fruit trigonous. *Female spikelet* consisting of 2—4 tightly sheathing bracts and a terminal flower, the basal portion of the spikelet subterranean, only the narrow, tubular tip of the uppermost bract and the style branches projecting. Perianth scales absent. Fruit more or less spherical.

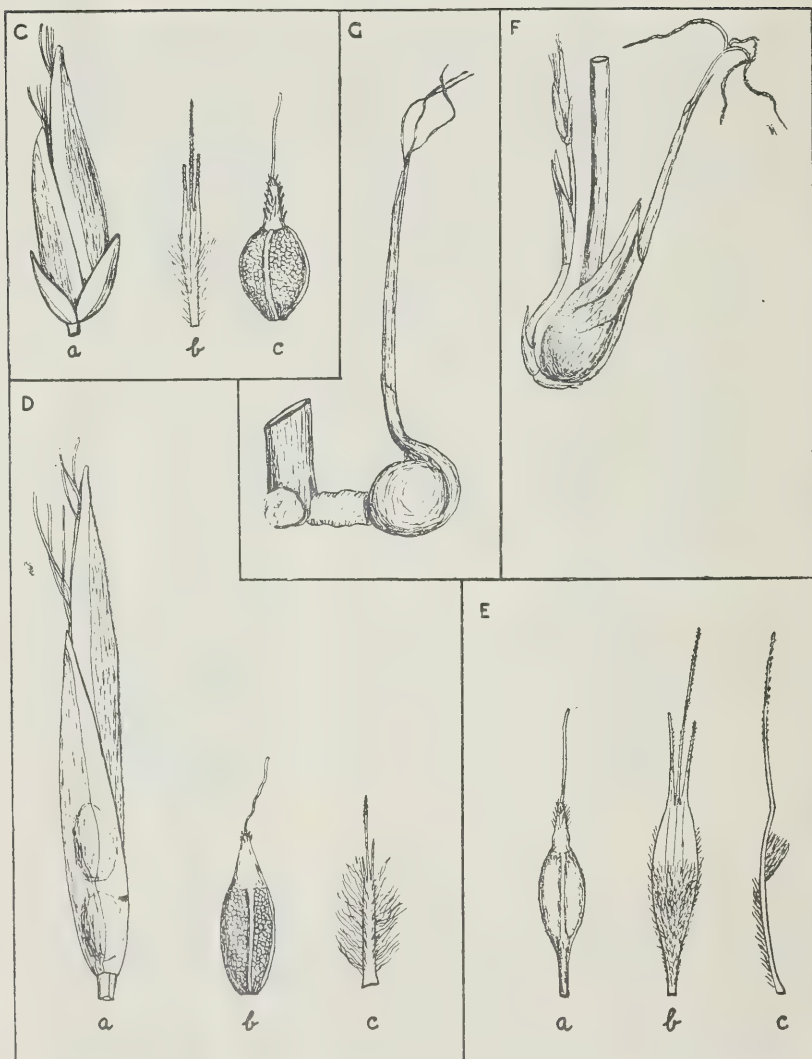


FIG. 2. *C. Trianoptiles capensis*. (a) External view of a spikelet in the fruiting stage; (b) A single perianth scale; (c) Early stage in the development of a fruit. All $\times 7.5$.

D. *T. solitaria*. (a) Spikelet bearing young fruits; (b) Young fruit; (c) Perianth scale from without. All $\times 7.5$.

E. *T. stipitata*. (a) Early stage in the development of the fruit; (b) Perianth scale as seen from the outside; (c) Perianth scale as seen in median longitudinal section. All $\times 7.5$. (Drawn from dried material.)

F. Base of *T. capensis* showing a young female spikelet and its relation to the aerial inflorescences: one of the subtending bracts removed $\times 5.5$.

G. Female spikelet of *T. capensis* in the fruiting stage, showing the axis which has arisen by intercalary growth $\times 5.5$.

Characteristic of places that are damp during the winter months.
Apparently confined to the winter rainfall area of the Cape Province.

Flowering season : August—October.

KEY TO THE SPECIES.

- A. Spikelets usually occurring in clusters; each spikelet normally with five bracts; axis not adnate to the penultimate bract.
 - B. Ovary sessile; cell outlines clearly visible on the three faces of the fruit 1. *capensis*
 - BB. Ovary stipitate; cell outlines not visible on the three faces of the fruit 2. *stipitata*
- AA. Spikelets occurring singly or in pairs; each spikelet usually with three bracts; axis adnate to the penultimate bract for the greater part of its length 3. *solitaria*

1. ***T. capensis*** (Steud.) Harv. Gen. S. Af. Pl. ed. 2, 422 (1868); Benth. in Hook. f. Ic. Pl. XIV, 34 t. 1348 (1881). *Ecklonea capensis* Steud. in Flora 138 (1829); Schrad. Anal. Fl. Cap. 34 (1832); C. B. Cl. Fl. Cap. VII, 271 (1898) and Illustr. Cyp. t. 77 4—9 (1909). *Carpha capensis* Martens ex Steud. Nomencl. ed. 2, i 300 (1840); Pfeiffer in Fedde Rep. XXIX, 180 (1931).

Plant up to 30 cm. in height, usually with many of the inflorescences projecting above the leaves. Bisexual spikelets in loose clusters, borne on branches of variable length, arising in the axils of leaves on an upright axis. Most bisexual spikelets with five bracts. Perianth scale linear or linear-oblongate, terminated by three bristles, the median the longest (Fig. 2 C (b)), outer surface sparsely villous at the base, the hairs principally close to the margin, glabrous a short distance below the bristles; inner surface with some hairs immediately within the glabrous area. Ovary obovoid, narrowing at the apex into a hispid beak. Fruit with well marked, smooth ribs running down the intersections of the faces, the cell outlines clearly visible on the three faces (Fig. 2 C (c)). Fruit of the female spikelet carried away from the main axis by intercalary growth.

Cape Div. Table Mountain, *Ecklon* 854 ! Stream beyond Camps Bay, *Wolley-Dod* 3129 ! Above Camps Bay, *Levyns* 7572 ! Newlands, *Levyns* 5150 ! Kenilworth, *Bolus* 7243 ! Hout Bay, *Levyns* 5201 ! Simonstown, *Levyns* 4747 ! Bonteberg, *Levyns* 5922 !

2. ***T. stipitata*** Levyns sp. nov.

T. capense valde affinis sed squamis perianthii majoribus, basitomentosis, et ovario stipitato angustiore faciebus levibus differt.

Plant up to 20 cm. in height, very similar to *T. capensis* in general habit. Distinguished from that species by (i) its perianth scales, which

are relatively larger, oblanceolate, much more densely and shortly hairy outside, and with a dense tuft of hairs on the inner surface a little below the bristles (Fig. 2 E (b), (c)), and (ii) its stipitate ovary, which is more slender, more acutely trigonous, and has smooth faces on which no cell outlines are clearly visible (Fig. 2 E (a)).

Cape Div. Maitland, *Wolley-Dod* 3244 ! Athlone, *Giffen* (*Levyms* 6017) (type in the Bolus Herbarium) ; Brackenfel, *Acock* (51068 in the Herbarium of the South African Museum) ! Stellenbosch Div. Hottentots Holland, *Pappe* (24259 in the Herbarium of the South African Museum).

3. *T. solitaria* *Levyms* nov. comb. *Ecklonea solitaria* C. B. Cl. in Fl. Cap. VII. 759 (1900) ; Kew Bull. Addit. Ser. VIII. 43 (1908). *Carpha solitaria* Pfeiffer Fedde. Rep. XXIX. 180 (1931).

Plant up to 20 cm. in height, many of the inflorescences short and somewhat hidden among the leaves, never projecting far beyond them. *Bisexual spikelets* arising singly (or occasionally in pairs) at rather distant points on a somewhat flattened axis. Spikelet long and narrow (Fig. 2 D (a)) with three bracts, the positions of the fruits clearly visible from without. Axis above the first flower adnate to the second bract for most of its length, the free part curved so that the second flower is superimposed on the first. Perianth scales hardly longer than the ovary, linear, densely villous, the two lateral bristles frequently absent or much reduced in size (Fig. 2 D (c)). Ovary slightly trigonous, passing gradually into an almost glabrous beak. Cell outlines clearly visible on the three faces of the fruit (Fig. 2 D (b)). Female spikelet with a very long sheathing bract round the style ; lacking the intercalary growth seen in *T. capensis*, consequently the fruits ripen in the axils of the leaves close to the stems.

Cape Div. Between Raapenberg Vlei and the Camp Ground, *Wolley-Dod* 3348 ! Kenilworth, *Levyms* 5892 ! Rondebosch Common, *Levyms* 7573 ; Brackenfel, *Acock* (51067 in the Herbarium of the South African Museum) !

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